Indiana Department of Education
SUPPORTING STUDENT SUCCESS

Strategies to Improve Instruction in Biology I

Office of Curriculum and Instruction

February 5, 2009

Indiana Department of Education

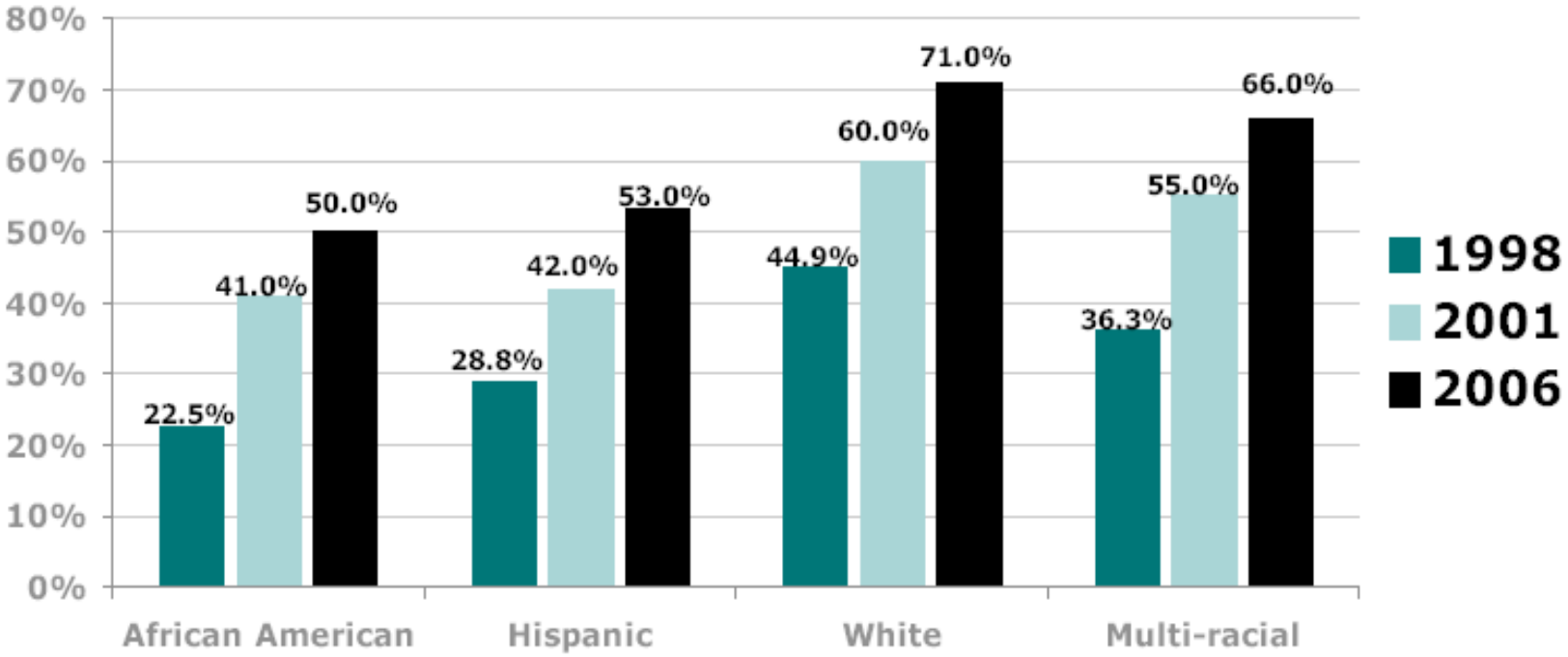
Indiana's Core 40 Curriculum

- Established as Indiana's college-prep curriculum in 1994
  - Voluntary for students
  - Required to be offered by schools
- Modified to reflect updated college- and workplace-readiness requirements beginning with the class of 2010
- Made the required high school curriculum for all students beginning with the class of 2011
- Indiana's need-based financial aid policy awards low income students additional financial aid if they graduate with Core 40

Core 40 requirements

- Students must complete
  - 4 years of English/Language Arts
  - 3 years of math (through Algebra II)
  - 3 years of science (Biology I, Chemistry I or Physics I or ICP, and any other Core 40 science course)
  - Physical education, health and electives
- Students must take mathematics of physics in their last two years of high school
- Academic Honors requires an additional higher-level courses
- Complete requirements available at http://www.doe.in.gov/core40/diploma_requirements.html

Indiana Core 40 diplomas awarded



Source: Indiana Department of Education

Biology I ECA

- NCLB requirement
- Every student who takes Biology I must take the assessment by time of graduation (preferably at the completion of the course).
- Teachers should try to incorporate student scores into the Biology I final grade.

Biology I Enrollment

- Enrollment trend for the last five years

2007-08	82, 935
2006-07	81, 105
2005-06	78, 583
2004-05	73, 111
2003-04	69, 425

- 0.3% of our students take Biology I as 8th graders (They take the assessment upon completion of the course.)

Biology I Instructional Strategies

- Improving reading comprehension
- Focusing instruction on major concepts
- Formative assessment

How Do We Teach Science?

- TIMSS 1999 Video Study

  "*The data suggest that U.S. eighth-grade science lessons can be characterized by a variety of activities that may engage students in doing science work, with less focus on connecting these activities to the development of science content ideas."*

Improving Reading Comprehension

You want me to teach reading?
But I'm a content teacher.
I don't have time to stop and teach reading.

Besides, I wouldn't even know how to begin.

-anonymous

Indiana Department of Education
SUPPORTING STUDENT SUCCESS

Improving Reading Comprehension *cont.*

"*It is of interest to note that the amount of vocabulary utilized in the reviewed science texts is actually higher than that recommended for high school foreign language courses* (Yager, 1983)."

Improving Reading Comprehension *cont.*

- Traditional science instruction involves presentation of new ideas expressed through new language.
- Science assessments are measuring conceptual understandings as well as command of scientific language
- Reading to learn not learning to read (a separate issue)

Practical Strategies to Improve Comprehension

- Tried and true reading techniques
  - Pre-reading or revealing misconceptions
    - Biology Concept Inventory: http://bioliteracy.net/
  - Use variety of reading sources (New York Times Science Section, Scientific American, Science News, Text…)
  - Guiding questions-focus reading
  - Reflection

Practical Strategies *cont*.

- Focus on application-Writing!

  Science notebooks (not a “lab notebook”!)

  Resources: www.sciencenotebooks.org

  - Claims/Evidence
  - Reflections
  - Analysis

Practical Strategies *cont*.

Content-first approach: use everyday language to introduce the primary ideas associated w/content prior to introducing scientific language.

Contrasting Examples: Core Standard 4

Content first approach:

"This is the inside of an *energy pouch* where plants make their own *food*. There are many *green pigments* inside of an *energy pouch*."

Scientific language approach:

"This is the inside of a *chloroplast* where plants make *glucose*. There is a lot of *chlorophyll* inside of a *chloroplast*."

*adapted from Brown and Ryoo, 2008

Focusing Instruction

- Academic standards = 51 indicators
- Focus instruction on larger concepts
  - Don’t make students guess what the 4 weeks of a unit are about!
- Core Standards: nine instructional targets

Frequent Formative Assessment: Unit Test vs. Dissecting Understanding

- The Unit Test: Finding out too late that students are not ready to move on
- Dissecting Understanding: near to immediate feedback that allows teacher to focus
- Tools: notecards, science notebook, personal whiteboards, concept mapping

Tools for Concept Mapping

- Software: http://cmap.ihmc.us/conceptmap.html

- By hand…science notebook provides quick check for understanding